adopts the second species of Johnston's *Northia*, the *N. conchylega* (*Onuphis conchylega* of Sars). But I cannot see why M. Malmgren adopts Dr. Johnston's genus and at the same time refuses to accept the species *tubicola* as the type. For my own part, I should have preferred retaining the genus *Nothria* for the species *tubicola*, and should have wished M. Malmgren had constituted a new genus for *conchylega*. The only generic difference between the two species, as far as I can see, consists in the presence of the two postoccipital cirri in *conchylega*, and their absence in *tubicola*. Johnston does not seem to have seen these cirri in the specimens of *conchylega* which he examined; and Sars, who originally described the species, takes no notice of them, either in his description or his figures (see Sars, Beskriv. og Jaktt. p. 61, tab. 10. fig. 28). Our British specimens of the species are unfortunately imperfect, those from Berwick Bay (Dr. Johnston's own specimens) consisting of tubes only and one fragment of the animal; while the specimens we possess from the sea off the Shetland Islands, collected by Mr. Jeffreys, are equally fragmentary, seven or eight specimens existing of the inferior half of the animal only, not one having the head or anterior portion of the body entire.

It is just possible, therefore, that the *Northia conchylega* described and figured by Sars and Johnston may turn out to be a distinct species from that described by Œrsted, Grube, Malmgren, &c., which not only possesses the postoccipital cirri, but, according to Œrsted's figure and description of *Onuphis Eschrichti* (considered to be synonymous with *conchylega* by Malmgren), has also bipartite branchiæ.

On the Natural History and Hunting of the Beaver (*Castor canadensis*, Kuhl) on the Pacific Slope of the Rocky Mountains, by Ashdown H. Green, Esq. With Supplementary Notes by Robert Brown, Esq., F.R.G.S. (Communicated by James Murie, M.D., F.L.S.)

[Read November 5, 1868.]

I have have been for three years almost constantly engaged in trapping beavers, so that what remarks I may have to make on their habits and history, though somewhat at variance with the

stereotyped notions prevalent in compilations, are yet the result of my own independent observations.

About January their tracks may be seen in the snow near the outlet of the lakes where young fir trees grow. At this time they prefer young fir trees as food to any other kind of tree, the reason, doubtless, being that at this period the sap has not risen in the willow or alder (*Alnus oregana*). It is not often that females are caught in the spring; and the males seem to travel about, as the runs are not used so regularly as they are when the beavers are living near.

Some of the beavers become torpid during January, especially those living near lakes, swamps, or large sheets of water which are frozen. They do not lay in a store of sticks for winter use as stated by Capt. Bonville (Washington Irving's 'Adventures of Capt. Bonville'), as one day's supply of sticks for a single beaver would fill a house—and if a stick were cut in the autumn, before the winter was over it would have lost its sap, and would not be eaten by the beaver. A beaver never eats the bark of a tree that is dead, though he may gnaw a hard piece of wood to keep his teeth down. A little grass is generally found in the houses, but is used as a bed and not for food.

If February is an open month, the beavers begin to come out of their retreats, and frequent any running water near them; but it is generally March before the bulk of them come out of winter-quarters. When they come out they are lean; but their furs are still good, and continue so till the middle of May—though if a trapper thought of revisiting the place, he would not trap after April, so as to allow them to breed quietly.

About the end of March the beaver begins to "call." Both males and females "call" and answer one another. Sometimes on one "calling," half-a-dozen will answer from different parts of the lake. I have known beavers to "call" as late as August. Males fight during the rutting-season most fiercely. Hardly a skin is without scars; and large pieces are often bitten out of their tails. The beaver holds like a bull-dog, but does not snap. It shakes its head so as to tear. When trapped, it will face a man, dodge a stick, and then seize it, taking chips out of it at every bite. It seems to attack from behind.

The period of gestation is known with little certainty, as they are never trapped in summer. The female brings forth some time about the end of June; and it is a year before a beaver is full-

grown; and even then it has not the *embonpoint* of an elderly beaver.

I have read that the beaver breeds at any time during the year; but this cannot be, or all the kittens that are trapped in the fall would not be of the same size. It produces from three to four at a birth. The teats are placed between the fore legs. The young (called kittens) whimper like young puppies when suckling, even when two months old. The females prefer deep sedgy lakes to bring their young up in, and they feed on grass about that time of the year (July or August). They feed on willow about April, May, and June. I cannot say whether they are born blind or not, but suspect so. They are very fond of water-lilies (*Nuphar advena*, Ait.) in the spring. It is with me a matter of uncertainty whether the female litters in a house, under the ground, or in the dry sedges; but I should think, under ground or in the houses. In the autumn more females are caught than males. Trapping commences in September and continues to May; after that the trappers leave them alone, so that I do not know much about their doings in the summer.

They begin to build their dams about July or August, as soon as the summer floods begin to subside. For this purpose they generally choose a bend in the stream, with high and clayey banks, and commence by felling a large tree that will reach across the water; or they fell a tree on each side of the water so as to meet in the centre. They then float sticks from 6 to 4 feet long down to the dam, and lay them horizontally, filling in the spaces with roots, tufts of grass, leaves, and clay or mud. The branches of the first tree are the perpendicular supports, almost all the remaining sticks being placed horizontally and crosswise. The last six or eight inches in height is very insecurely constructed, being nothing but mud and leaves.

The highest dam I ever saw was only about 4 feet 6 inches; but the generality of them are not above 2 or 3 feet. The action of the water by bringing down mud, gravel, or fallen leaves, strengthens the dam by making a sloping bank against it; and, the willow sticks of which it is composed sending forth their roots and shoots, the dam in course of time becomes a fixture bound together as strongly as well could be. The winter floods almost invariably destroy the upper part of the dam, which is reconstructed afresh every year. The shape of the dam is almost always semicircular, with the crown of the arch down stream, thus reversing the order of things; but

I have no doubt this is in consequence of the heads of the first or principal trees being floated down stream when they are first thrown. The body of water raised by these dams varies, of course, according to the fall of the original stream, from a small hole of 20 feet diameter to a lake of miles in length. In the former case the Beaver builds his house close to the dam, so as to get depth of water, and there saves himself from any hungry panther (*Felis concolor*, L.) or wolf who might feel inclined to indulge in beaver-meat. The beaver also burrows into the banks of streams, always taking care to have two entrances, one under (or close to) the water, and a smaller air-hole on land. With a good dog, capital sport may be had on some of the smaller rivulets leading into or out of a lake. The houses are formed of water-logged sticks placed horizontally in the water. They have always two or more entrances, and a small chamber with a little grass for the beaver to lie on. The top of the house is constructed very thick, to guard against attacks by animals. Mud and roots are used to make the the house solid; but no mud is seen from the outside, as the top is covered with loose sticks left there by the beaver after taking the bark off. The houses are generally about 4 feet in height, and about 6 in diameter on the outside, and would hold about four Beavers, though I have known small houses to hold two only.

The traps generally used in securing the beaver are large steel traps with a strong spring at each end, and fastened with a chain, from 4 to 6 feet long, to a pole, which is stuck in the bottom of the water as far out as the chain will allow, so that the beaver, when he feels the trap, may run into deep water; and as he gets tired, the weight of trap taking him down, he drowns. A beaver, when trapped, never tries to get to land, but makes a dive for the deepest water; and should the water be shallower than 4 feet, he will, in a short time, amputate his foot so as to relieve himself. He always takes his foot off at a joint, and draws the sinews out of his shoulder instead of biting them through. The stump heals up; and I think the beaver is none the worse for it, though he gets shy, and, perhaps, tells the other beavers to beware of traps. A beaver is generally caught by his fore foot; and should the trap be set too deep below water, his toe-nail only gets caught. The trap is set in the beaver-run, or just where it springs into a hole in the bank. It must not be set in too shallow water, for then he amputates his foot,—or in too deep, for in that case he does not get caught at all, but swims over the

trap. The proper depth to set a trap is 5 inches. The beaver is then caught by his fore foot. Sometimes the teeth of a beaver are found to have grown beyond their proper length. I once saw one with the lower teeth 3½ inches beyond the gums. He was caught in a trap, and was miserably thin; but, singularly enough, he had about the finest fur I ever saw. He was an aged animal. It is rare to see a beaver which has been trapped with its teeth whole, as they are often broken in trying to get out of the trap. A full-grown beaver weighs about 34 lbs. I am not an anatomist; but still I do not think there is anything very peculiar about its internal structure*, except that the heart weighs a mere nothing —the cavities being so very large. An old beaver when shot sinks, a kitten floats. A good skin will weigh 2½ lbs.; but it is very rarely that one weighing that amount is caught in Vancouver Island. The Hudson's Bay Company give only from 75 to 85 cents per lb. at Victoria for peltries, so that a trapper now-a-days cannot get very fat at the work. There are at present very few beavers on either Vancouver Island or the mainland, compared with what there must have been some years ago; but they have been increasing for the last six years; and no doubt by the time beaver-skins come into fashion again there will be a plentiful supply.

Supplementary Notes by Mr. Brown.

The following I add as an Appendix to the foregoing observations of my friend Mr. Green, whose opportunities for studying the animal were much superior to my own during my travels in North-west America, and whose account is valuable as being the plain unvarnished notes of a hunter—a narration of facts very familiar to him, written with no reference to preconceived notions or received theories. First, therefore, regarding the range of the beaver. It is found all over British Columbia, Oregon, Washington Territory, and even south to California and north to the limit of trees. It is not, however, found, as far as I can learn, in the Queen Charlotte Islands, but is abundant in Vancouver Island, though, curiously enough (in such a manner is history written) Colonel Colquhoun Grant, in his 'Description of Vancouver Island' (Journal of the Royal Geographical Society, vol. xxvii. p. 268), mentions that he has seen traces, and was not aware

* *Vide* Cleland, Edin. New Phil. Journal, new series, vol. xiii. (1860) pp. 14-20.

that the animal itself had been found. The fact of the matter is, he could have found abundance not far from his own door. Near Victoria, in Mr. Yales's Swamp, and in one near Dr. Tolmie's, are several beavers; and on the road to Cadborough Bay there are, in a small stream near where the road crosses, the remains of an old dam. In the interior they are almost everywhere abundant and on the increase. In a swampy lake near the mouth of the Cowichan Lake we found many; and an extensive swamp near the entrance of the Puntledge Lake was a great stronghold. On Young's Creek *, flowing into the same lake, were many dams. In the spring of 1866, when crossing the island from Fort Rupert to the head of Quatseeno Sound with some Indians, a great portion of our route lay among these beaver-ponds and dams. All through this district beavers swarm. The camps of the Indians were full of them; and the women laid before us the daintiest pieces of the meat, or exhibited to their white visitor all sorts of curiosities in the shape of fœtal beavers and beaver's teeth, with which they were gambling, using marked ones in much the same manner as our dice. At the Hudson Bay Company's Fort we lived upon beaver during that spring—beaver roasted and beaver broiled; beaver tail and beaver joint; beaver morning, noon, and night! In regard to the beavers' houses, I am forced to come to the conclusion either that travellers who have written regarding the beaver in the country east of the Rocky Mountains have woefully taken advantage of a traveller's license, have listened to mere hearsay wonders without seeing for themselves, or that the habits of the beaver differ much in different parts of the country.

It is only after they have been pointed out to you that the "houses" can be recognized, as they seem like loose bundles of sticks lying on the water †. In a recent account of the Beaver in the British provinces in North America by an anonymous writer ‡, the houses are described as being exactly the same as I have seen them in the West, and not plastered domes. The vigilance of the little builders is so great that it is rarely, unless closely watched for a long time, that they can be seen. A passing traveller rarely surprises them at their work.

* See the author's map and the memoir *Das Innere der Vancouver Insel* in Petermann's *Geographische Mittheilungen*, 1869, S. 87.

† The "house" in the Zoological Gardens, London, corresponds with this description.

‡ 'Land and Water,' March 1868.

My friend Mr. John Tod, chief trader in the Hon. Hudson's Bay Company's service during a long residence at Fort M'Leod (a post of that Fur Company, situated in the northern portion of British Columbia), has communicated to me his observations, which, differing in some respects, substantiate in the main those of Mr. Green. The Beaver has from *four to ten young*—most often four, sometimes eight, rarely ten. It carries its young *six months*. It produces *in May*. When the female is going to have young the male takes the young of last year (for sometimes as many as three generations will remain around the paternal abode), and goes up a river several miles, remaining there until the female has produced.

The dams here, as everywhere else, are perfectly constructed, and with an opening in the middle for the current. The only approach to plastering their houses which I have observed is its giving a self-satisfied "clap" of the tail on laying down its load*. The loads are carried between the top of the fore paws and the under surface of the head. The trailing of the tail along the ground gives the vicinity the appearance of being plastered. The house has two flats: the bottom one is on a level with the water; the top one is used to sleep in, and has communication with the water through the bottom. The top one has direct communication with the land. Sometimes they live in merely a tunnel or cave. In winter the Indians go along the edge of the ice, sounding with a stick; and wherever there is the opening of one of these tunnels, the sound being different, he watches and plugs up the opening. If these holes or tunnels are used as escapes from the houses, they break into the latter. If the beaver is not in, the Indian makes a hole in the ice. He then makes a great noise, and watches the rippling of the water to see if he is there, because his motion will have that effect. When alarmed he generally rushes for his hole; and finding it closed, he is often shot in his endeavour to escape. In *trapping*, some strong-smelling stuff (commonly castoreum in rum or cinnamon) is spread on the path. The trap is then set in the water close to the bank, and covered with about four inches of water. The beaver, attracted by the strong-smelling substance, gives an approving slap of his tail, and starts off, if anywhere in the neighbourhood, to investigate the booty; and as he is leaving the

* On this point *vide* A. Murray, Edin. New Phil. Journal (1859), vol. ix. (n. s.) p. 216.

water, gives a "purchase," so as to spring up the bank on the very place where the trap is concealed. His food is principally willows. The bark is preferred, though the wood is eaten when nothing else can be got. It will gnaw through thick trees, apparently for the top foliage; for immediately the tree falls the beavers spring on the branches of it. A stump showing beaver-gnawing is not unlike Indian chopping (small irregular chops); and novices in the back woods often mistake them for Indian "sign." Large trees are universally felled so as to fall with the head to land, because, if required for floating down, the branches would impede it being floated off, while the difficulty of dragging it down is not so great, over and above the fact of the impeding branches being easily gnawed off. Much ingenuity is displayed to effect the fall of the tree in the proper position. I have often, in my walks and sails along the solitary rivers of the western wilds, seen three or four beavers piloting a large tree down stream, and noticed that when they were approaching its destination they shoved it into the eddies inshore. They always cut down the trees *above* their lodges, never on any occasion *below*. In winter *they have a store of food secured at some convenient distance from their abodes.* When they require any they start off to get it. They do not eat there, but bring it to their house, and there make their meal. Of the almost human intelligence of the "thinking beaver" the stories are innumerable; but many of them are much exaggerated, or even fabulous (such as Buffon's account). The following is tolerably well authenticated, my informants vouching for the accuracy of it. In a creek about four miles above the mouth of Quesnelle River, in British Columbia, some miners broke down a dam, in the course of the operation for making a ditch, at the same time erecting a wheel to force up the water. Beavers abounded on this stream, and found themselves much inconvenienced by these proceedings. Accordingly, it is said that, in order to stop the wheel, the beavers placed a stick between the flappers in such a way as to stop the revolutions of the wheel. This was so continually repeated night after night, and was so artfully performed, as to preclude the possibility of its being accidental.

In "Notes on the Habits of the Beaver," presented to the Royal Physical Society by Mr. James K'Kenzie*, of the Hudson Bay

* Proceedings of the Royal Physical Society, Session 1861–62, and Edin. New Phil. Journal, vol. xv. pp. 299–302.

Company's Service, and to all appearance most careful and trustworthy, details are given differing somewhat from those related by Messrs. Green (in the foregoing paper) and Tod.

When I lived among the Opicheshaht Indians, at the head of the Alberni Canal, V. I., I heard much about *Attoh*, the Beaver, but remarkably little to the credit of its sagacity. They look upon it as rather a common-place animal, requiring no particular skill to trap. They used to tell us all sorts of stories about it; but I think they all contain a vein of fiction. Mr. G. M. Sproat has gathered some of this information into his excellent 'Scenes and Studies of Savage Life,' to which I refer. The beavers lie in these houses, as the Indian expresses it, "like boys;" but when the female has young ones she goes into a separate bed or chamber, I could not ascertain which. There is no story in a beaver-house for convenience of change in case of floods; the waste-way is generally sufficient to carry off any extraordinary quantity of water. In the Alberni country, at least, the houses on the banks of lakes are abandoned when the water is very high; and the Beavers go to small streams, which they form into a succession of diminutive lakes; in these they breed*. He sleeps during the day, and comes out at night to feed. He cannot see far, but he is keen of scent. The Opicheshaht approach to leeward at night, and spear the Beaver from a canoe as he floats eating a branch taken from the shore; or they shoot him when he is in shallow water, but not in deep water, as he sinks on receiving the shot. They also block up the opening into his house, break through the wall, and shoot or spear him.

The flesh of the beaver, especially when first smoked and then roasted, is not at all unwelcome as an article of food. The tail, when boiled, is a noted article of trappers' luxury, though, forsooth, if the truth must be told, rather gristly and fat, and rather too much for the stomach of any one but a North-western hunter or explorer. "*He is a devil of a fellow*," they say on the Rocky Mountain slopes; "*he can eat two beavers' tails!*" The scrapings of a beaver's skin form one of the strongest descriptions of glue. The Indians at Fort M'Leod's Lake use it to paint their paddles; and the water does not seem to affect it.

When beaver was 30*s.* per lb. Rocky-Mountain beavers were piled up on each side of a trade gun until they were on a level with the muzzle, and this was the price! The muskets cost in

* Sproat, *lib. cit.* 249.

England some 15*s*. These were the days of the "free trapper"—joyous, brave, generous, and reckless—the hero of romance, round whom many a tale of daring circles, the love of the Indian damsel, the beau ideal of a man, in the eyes of the half-breed, whose ambition never rose higher than a *coureur de bois*—a class of men who, with all their failings, we cannot but be sorry to see disappearing from the fur-countries. The fall of Beavers' peltry rang their death-knell; and, as a separate profession, trapping is almost extinct, being nearly altogether followed, at uncertain spells, by the Indians and the lower class of half-breeds. The world is fast filling in; the emigrant, with his bullock-team and his plough, is fast destroying all the romance of the far West—fast filling up with the stern prose of the plough and the reaping-machine and the whistle of steam what was once only claimed by the pleasant poetry of the songs of the *voyageur*, the *coureur des bois*—the hunters and trappers of the great fur companies! But perhaps it is better after all!

The beaver is easily domesticated, and learns to eat any vegetable matter, but requires water occasionally. One kept at Fort M'Leod got blind; but if it got access to water, it laved some on its eyes, and generally in an hour quite recovered its sight. It used to gather carpenter's shavings together, and carry them to the door; if the door was shut, it forced them up against it, finishing with a slap of its tail, as if it were building a dam. It had a great antipathy to the Indians. It would come into the Indian Hall, where the natives were seated, as is their wont, back to the wall. It would first take their fire-bag, then their axe, and so on until it had carried everything to the door, greatly to the amusement of the Indians. It would then attempt vigorously to eject the owner of the articles. Its "weakness" for gnawing exhibited itself in a very unpleasant manner; for occasionally, in the morning, the whole of the furniture was prostrate, the beaver having gnawed through the legs of the tables and chairs!

This leads me to remark that the beaver might be easily naturalized again in Britain; and though I cannot recommend them in the light of a drawing-room pet, yet I can conceive no more pleasant inhabitant of our lakes and rivers*. We must remember that at one time the beaver was an inhabitant of these islands, but became early extinct. This was, of course, not the *Castor Canadensis*, but the *C. fiber*, Linn.; for the remains found in

* *Vide* 'Farmer,' April 1868.

Britain have now been decided to belong to the latter species, which is, I believe, not yet altogether extinct in Scandinavia *. We have, however, historical accounts of its former abundance in this country; and I cannot better conclude these desultory notices than by recapitulating the information we possess regarding it as a former inhabitant of the British Isles, referring for a more particular account of it as a Scottish animal, extinct within historic periods, to Dr. Charles Wilson's 'Researches on Castoreum and the Beaver in Scotland.' The earliest notice of it we know is in the ninth century, viz. in the Welsh Laws of Hywel Dha †, where we read of it even then as a rare or valued animal of the chase; for while the Marten's skin is valued at twenty-four pence, the Otter's at only twelve pence, that of the Llosdlydan, or Beaver, is valued at the great sum of one hundred and twenty pence, or at five times the price of the Marten's, or ten times the price of the Otter's. It thus seems even in the times of the Heptarchy to have been on the decrease; its sun had early begun to set. In the year 1158 Giraldus de Barri (or, as he is variously called, Sylvester Giraldus or Giraldus Cambriensis), in his droll account of the itineration he made through Wales, in company with Baldwin, Archbishop of Canterbury (who journeyed thither in order to stir up the Welsh to join in the Crusades, and who afterwards followed the train of Richard Cœur de Leon, and fell before Acre), tells us that in his day it was only found on the river Teivi, in Cardiganshire, and gives a curious account of its habits, derived in part from his own observations. In John Ray's time many of the places in the neighbourhood of the river bore the name of *Llynyrafrange*, or the Beaver Lake, and, for all we know to the contrary, may to this day. About the same time it was probably known in Scotland, but only as a rare animal. Hector Boece (or Boethius, as his name has been Latinized), that shrewd old father of Scottish historians, enumerates the *fibri*, or Beavers, with perfect confidence as among the inhabitants of Loch Ness, whose fur was in request for exportation towards the close of the fifteenth century; and he even goes further, and talks of an "incomparable number," though perhaps he may be only availing himself of a privilege which moderns have taken the liberty of granting to mediæval authors when dealing with curious facts. Bellenden, in a translation of Boethius's 'Croniklis of

* Nilsson: Skandinavisk Fauna, Första Delen, *Daggdjuren*, ss. 409–427.

† Leges Wallicæ.

Scotland,' which he undertook, at the request of James VI., about the middle of the sixteenth century, while omitting Stags, Roe-deer, and even Otters, in his anxiety for accuracy, mentions "Bevers," without the slightest hesitation:—"*Mony wyld hors and amang yame are mony martrikis* (Pine Martens), *bevers, quhitredis* (Weasels) *and toddis* (Foxes) *the furrings and skynnis of thame are coft* (bought) *with gret price amang uncouth* (foreign) *merchandis.*" It is, however, more than probable that the worthy historians were influenced by a little national pride when they recorded the Beaver as an inhabitant of Loch Ness in the fifteenth century, as no mention is made of it in an Act dated June 1424, though *Martricks*, *Fourmartes* (Polecats), *Otters*, and *Toddis* are specified. They were perhaps so strongly impressed by the wide-spread tradition of its existence in former days, as to be led to enumerate it among the animals of Scotland in those times; and it may be mentioned in passing that both worthies boast immoderately of the productions of their country. At the beginning of this century (at least) the Highlanders of Scotland had a peculiar name for the animal—Losleathan or Dobhran losleathan, "the Broad-tailed Otter." According to Dr. Stuart, of Luss, in a letter to the late Dr. Neill, quoted by Prof. Fleming *, a tradition used to exist that the Beaver or "Broad-tailed Otter," once abounded in Lochaber. That may be so or not; but at all events it does not now exist anywhere within the bounds of the British islands; and a considerable doubt might be still thrown on the accounts of the old writers, were not remains continually dug up in all parts of the country. I would fain hope that in a few years it may again be an inhabitant of our lakes and rivers.

In these scattered notes I have not attempted anything like a systematic history of the animal, leaving the separate accounts to tell their own tales. No more pleasing work could, however, be written than a Monograph of the Beaver, anatomically and historically; and I trust that before long it may be undertaken by some one at once an artist and a naturalist †.

* Edin. Phil. Journ. 1838.

† [This wish has been in some respects anticipated in a volume, 'The American Beaver and his Works,' by Lewis H. Morgan: Philadelphia, 1868. It had not fallen into Mr. Brown's or my hands when this paper was read.—J. Murie.]